City of Woburn Contributory Retirement System

Actuarial Valuation Report

Plan Year: January 1, 2020

September 2020

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Section I - Overview

The City of Woburn Retirement Board has engaged Buck to prepare an actuarial valuation of the Retirement System as of January 1, 2020. Employee data and asset information used in the valuation were provided by the Retirement Board.

The valuation was prepared pursuant to Chapter 32 of the Massachusetts General Laws, based upon the acceptance of Section 22D.

The purposes of the valuation are to:

1) analyze the current funded position of the System and determine the level of contributions necessary to assure sound funding;

2) update the Section 22D funding schedule currently in place for the Retirement System; and

3) provide reporting and disclosure information for financial statements, governmental agencies and other interested parties.

Use of this report for any other purpose may not be appropriate and may result in mistaken conclusions due to failure to understand applicable assumptions, methodologies, or inapplicability of the report for that purpose. Buck should be asked to review any statement to be made on the basis of the information presented in this report. Buck will not accept any liability for any such statement made without prior review by Buck.

Schedule A of this report outlines the actuarial assumptions and methods used in the valuation. All assumptions are the same as those used in the previous valuation, except that the mortality assumption was updated to reflect more recently available information and the assumed plan expenses included in the normal cost was updated to better reflect actual plan experience. The economic assumptions are based upon a review of the current portfolio structure and economic environment and represent expectations with respect to future experience.

Schedule B of this report outlines the principal plan provisions reflected in the valuation. All provisions are the same as those reflected in the previous valuation.

Section II provides a summary of the principal valuation results. Section V provides a projection of the Section 22D funding amounts and funded status reflecting the plan sponsor's funding policy of compliance with Section 22D of MGL Chapter 31 and the expectation of no future gains or losses.

Where presented, references to "funded percentage" and "unfunded accrued liability" typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded percentages and unfunded accrued liabilities. Also, the "net pension liability" and "plan fiduciary net position as a percentage of the total pension liability" are measured on a market value of assets basis. These items presented may be appropriate for evaluating the need and level of future contributions but make no assessment regarding the cost to settle (i.e., purchase annuities to cover) any portion of the Fund's liabilities.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, changes expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions, applicable law or regulations. An analysis of the potential range of such future differences is beyond the scope of this valuation.

Section I – Overview (continued)

This report fairly represents the actuarial position of the City of Woburn Retirement System as of January 1, 2020, in accordance with generally accepted actuarial principles applied consistently with the preceding valuation. In my opinion, the actuarial assumptions used to compute actuarial accrued liability and normal cost are reasonably related to plan experience and to reasonable expectations and represent my best estimate of anticipated plan experience. The valuation was performed by, and under the supervision of, actuaries who have experience in performing valuations for public retirement systems. I am a Member of the American Academy of Actuaries and meet the Academy's Qualification Standards to issue this Statement of Actuarial Opinion and am available to answer any questions regarding the results.

Respectfully Submitted,

Buck Global, LLC (Buck)

Hilja Viidemann

9/30/2020

Hilja Viidemann, FSA, MAAA, EA
Director, Retirement

Date

Section II - Summary Of Principal Results

1. For convenience of reference, the principal results of the valuation as of January 1, 2020 are summarized below along with a comparison with the amounts in the previous valuation as of January 1, 2018.

Valuation Date		January 1, 2018		January 1, 2020
a) Active Members:				
Number		587		478
Annual compensation	$	30,893,029	$	29,406,301
Average age		48.8		49.7
Average service		12.8		13.6
Average compensation	$	52,629	$	61,519
b) Pensioners and beneficiaries:				
Number		462		495
Annual benefit payments	$	12,378,993	$	15,298,094
Average benefit	$	26,794	$	30,905
c) Inactive employees:				
Number		80		104
Accumulated employee contributions	$	698,372	$	779,965
d) Actuarial accrued liability	$	226,383,224	$	252,067,065
e) Market value of assets	$	148,441,286	$	159,393,849
f) Assets for valuation purposes	$	143,513,760	$	153,889,068
g) Unfunded actuarial accrued liability (d. – f.)	$	82,869,464	$	98,177,997
h) Funded percentage (f. / d.)		63.39%		61.05%
i) Section 22D funding for fiscal 2021	$	8,502,325	$	9,071,694
j) Section 22D funding for fiscal 2022	$	8,820,047	$	11,059,368

A projection of Section 22D costs is presented in Section V. Schedule A of this report outlines the actuarial assumptions and methods employed. The provisions of the System are summarized in Schedule B. The valuation includes additional liabilities resulting from Chapter 17 COLA legislation.

Section III - Membership Data

In order to calculate the aggregate liabilities and assets on account of members of the System as of January 1, 2020, data was needed with respect to each active and retired member and beneficiary of the System. The data with respect to active, retired and terminated members and beneficiaries were furnished to the actuary by the Retirement Board.

From the data, tabulations were made showing, as of January 1, 2020, the number and annual compensation of active members classified by age and years of service and the number and annual retirement allowances of retired members and beneficiaries as of January 1, 2020, classified by age. These tables are presented in Schedule C.

The following tables show the number of active and retired members of the Retirement System as of January 1, 2020.

Table I - The Number and Annual Compensation of Active Members as of January 1, 2020

Group	Number	Compensation
General employees	337	$ 16,939,630
Police and Fire	141	$ 12,466,671
Total	478	$ 29,406,301

Table II - The Number and Annual Retirement Allowances of Retired Members and Beneficiaries as of January 1, 2020

Annual Retirement Allowance		
Group	Number	Pension[1]
Service Retirements	366	$ 11,652,185
Disability Retirements	35	$ 1,502,788
Beneficiaries of Deceased Members	94	$ 2,143,121
Grand Total	495	$ 15,298,094

In addition, there are 104 members with estimated deferred benefits valued at $779,965.

[1] Pension amounts exclude cost-of-living adjustments applied after July 1, 1981, and prior to July 1, 1998, which are funded by the Commonwealth of Massachusetts.

Section IV - Assets

The amount of assets taken into account in this valuation is based on financial information reported by the Retirement Board. As of January 1, 2020, the reported market value of Retirement System assets amounted to $159,393,849. The actuarial value of assets for valuation funding purposes is $153,889,068. Valuation assets are developed using a smoothing method (described in Schedule A of this report) in order to smooth the year-to-year fluctuations due to deviations of investment returns from expected levels.

Year Ending	December 31, 2018	December 31, 2019
1. Market value of plan assets, prior year end	$ 148,441,286	$ 136,187,357
2. Employer and employee contributions, net transfers and reimbursements	$ 12,082,917	$ 13,226,034
3. Expenses	$ (612,291)	$ (631,631)
4. Benefits and refunds	$ (14,472,368)	$ (15,480,867)
5. Expected interest during the year	11,011,150	10,096,788
6. Expected market value of plan assets, current year	$ 156,450,694	$ 143,397,681
7. Actual market value of plan assets, current year	$ 136,187,357	$ 159,393,849
8. Investment gain/(loss) during prior year [7. – 6.]	$ (20,263,337)	$ 15,996,168
9. Investment gain/(loss) during second prior year	$ 11,343,662	$ (20,263,337)
10. Investment gain/(loss) during third prior year	$ 1,641,920	$ 11,343,662
11. Investment gain/(loss) during fourth prior year	$ (11,691,609)	$ 1,641,920
12. Tentative Valuation Assets before reflecting 80% - 120% corridor = [7. – 80% x 8. – 60% x 9. – 40% x 10. – 20% x 11.]	$ 147,273,383	$ 153,889,068
13. 80% of actual market value = 80% x 7.	$ 108,949,886	$ 127,515,080
14. 120% of actual market value = 120% x 7.	$ 163,424,828	$ 191,272,618
15. Valuation Assets = 12. But not less the 13. or greater than 14.	$ 147,273,383	$ 153,889,068
16. Ratio of actuarial value to market value	108.14%	96.55%
17. Actuarial Value Return for prior year	4.76%	6.52%
19. Market Value Return for prior year	(6.30%)	19.36%

Section V - Contributions Payable Under the System

Section 22D of MGL Chapter 32 outlines various requirements of a funding schedule that will amortize the unfunded actuarial liability and cover normal costs. The normal cost and unfunded actuarial liability are to be calculated in accordance with the individual entry-age-normal actuarial cost method. The contribution toward amortization of the unfunded actuarial liability may increase by up to 4½% each year.

The following table presents a projection of contributions that satisfy the Section 22D requirements. The forecast is based upon an assumption of a stable population in which the total payroll and normal cost of the system are expected to increase 4.0% per year. The employee contribution rate is expected to increase to 10.5% by 2045 as members contributing base percentages 5%, 7%, and 8% are replaced by new members, whose base contribution is 9%. The unfunded accrued liability contribution is also based on a 4% annual increase and is assumed to be paid each September 1. This schedule incorporates the funding required to provide annual COLAs under Chapter 17 of the Acts of 1997.

Please note that the amounts shown in the following schedule for the 2021 fiscal year represent the actual amounts already appropriated by the City for the 2021 fiscal year.

The 2022 appropriation is approximately $11.1 million, or about 18% higher than the amount shown in the 2018 valuation report. This is the result of generally unfavorable actuarial experience. The primary factors leading to the increase are the following:

1. Despite a return of 19.36% on the market value of assets, there was a loss on the actuarial value of assets because of the recognition of past investment losses through the asset smoothing method. The effective return on the actuarial value of assets was 6.52%. This accounted for an increase of approximately $0.5 million.
2. The demographic experience over the past two years was unfavorable. The primary sources of the loss were pay increases and cost-of-living increases that were greater than expected. This accounted for an increase of about $1.2 million.
3. The mortality improvement assumption was updated to Scale MP-2019 to reflect more recently available information. In addition, the assumption of plan expenses was updated to better reflect actual plan experience. These assumption changes decreased the appropriation by about $0.1 million.

Section V - Contributions Payable Under the System (continued)

Pension Reform Act - Section 22D Funding Requirements

Fiscal Year Ending	Payroll[1]	Unfunded Accrued Liability[2]	Employee Contribution	Employer Normal Cost with Interest	Amortization Payments with Interest	Employer Total Cost with Interest	Employer Total Cost % of Payroll	Funded Ratio %[2]
2021	29,406,301	98,177,997	2,651,727	1,967,187	7,104,507	9,071,694	30.8%	61.1%
2022	30,582,553	98,325,235	2,776,687	2,007,675	9,051,693	11,059,368	36.2%	62.2%
2023	31,805,855	96,420,125	2,907,400	2,060,881	9,413,760	11,474,641	36.1%	64.0%
2024	33,078,089	94,000,953	3,044,128	2,115,194	9,790,310	11,905,504	36.0%	65.6%
2025	34,401,213	91,014,316	3,187,143	2,170,622	10,181,923	12,352,545	35.9%	67.9%
2026	35,777,262	87,402,212	3,336,727	2,227,171	10,589,200	12,816,371	35.8%	69.8%
2027	37,208,352	83,101,673	3,493,180	2,284,840	11,012,768	13,297,608	35.7%	71.9%
2028	38,696,686	78,044,366	3,656,809	2,343,633	11,453,278	13,796,911	35.7%	74.2%
2029	40,244,553	72,156,163	3,827,940	2,403,548	11,911,410	14,314,958	35.6%	76.6%
2030	41,854,335	65,356,683	4,006,911	2,464,584	12,387,865	14,852,449	35.5%	79.2%
2031	43,528,508	57,558,796	4,194,074	2,526,737	12,883,380	15,410,117	35.4%	82.1%
2032	45,269,648	48,668,082	4,389,800	2,590,001	13,398,716	15,988,717	35.3%	85.2%
2033	47,080,434	38,582,259	4,594,473	2,654,367	13,934,665	16,589,032	35.2%	88.5%
2034	48,963,651	27,190,562	4,808,496	2,719,827	14,492,051	17,211,878	35.2%	92.0%
2035	50,922,197	14,373,073	5,032,290	2,786,366	15,071,734	17,858,100	35.1%	95.9%
2036	52,959,085	0	5,266,294	2,853,969	0	2,853,969	5.4%	100.0%
2037	55,077,448	0	5,510,966	2,922,617	0	2,922,617	5.3%	100.0%
2038	57,280,546	0	5,766,786	2,992,289	0	2,992,289	5.2%	100.0%
2039	59,571,768	0	6,034,255	3,062,959	0	3,062,959	5.1%	100.0%
2040	61,954,639	0	6,313,894	3,134,599	0	3,134,599	5.1%	100.0%
2041	64,432,825	0	6,606,249	3,207,177	0	3,207,177	5.0%	100.0%
2042	67,010,138	0	6,911,890	3,280,657	0	3,280,657	4.9%	100.0%
2043	69,690,544	0	7,231,413	3,354,997	0	3,354,997	4.8%	100.0%
2044	72,478,166	0	7,565,438	3,430,152	0	3,430,152	4.7%	100.0%
2045	75,377,293	0	7,914,616	3,506,071	0	3,506,071	4.7%	100.0%
2046	78,392,385	0	8,231,200	3,633,515	0	3,633,515	4.6%	100.0%
2047	81,528,080	0	8,560,448	3,765,673	0	3,765,673	4.6%	100.0%
2048	84,789,203	0	8,902,866	3,902,721	0	3,902,721	4.6%	100.0%
2049	88,180,771	0	9,258,981	4,044,844	0	4,044,844	4.6%	100.0%
2050	91,708,002	0	9,629,340	4,192,232	0	4,192,232	4.6%	100.0%
2051	95,376,322	0	10,014,514	4,345,083	0	4,345,083	4.6%	100.0%

[1]Calendar year basis
[2]As of preceding January 1

Section VI – PERAC Annual Statement

The most recent actuarial valuation of the System was prepared by Buck as of January 1, 2020

The normal cost for employees on that date was:	$2,651,727	9.0% of pay
The normal cost for the employer was:	1,863,524	6.3% of pay

The actuarial liability for active members was:	$97,788,640
The actuarial liability for retired and inactive members was:	154,278,425
Total actuarial accrued liability:	$252,067,065
System assets as of that date:	153,889,068
Unfunded actuarial accrued liability:	$98,177,997

The ratio of system's assets to total actuarial liability was:	61.1%

The principal actuarial assumptions used in the valuation are as follows:

Investment Return:	7.50%
Rate of Salary Increase:	4.00%

Schedule of Funding Progress

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (b)	Unfunded Actuarial Accrued Liability (b - a)	Funded Ratio (a / b)	Covered Payroll (c)	UAAL as a percent of Covered Payroll (b - a) / c
1/1/2020	$153,889,068	$252,067,065	$98,177,997	61.1%	$29,406,301	333.9%
1/1/2018	$143,513,760	$226,383,224	$82,869,464	63.4%	$30,893,029	268.2%
1/1/2016	129,316,338	205,524,287	$76,207,949	62.9%	29,187,382	261.1%
1/1/2014	115,874,621	179,447,442	$63,572,821	64.6%	28,945,300	219.6%
1/1/2012	106,181,870	162,639,000	$56,457,130	65.3%	27,681,194	204.0%
1/1/2010	104,707,479	154,299,627	$49,592,148	67.9%	27,433,458	180.8%
1/1/2009	110,478,130	141,758,527	$31,280,397	77.9%	24,431,654	128.0%
1/1/2007	102,354,232	132,433,233	$30,079,001	77.3%	24,258,365	124.0%

Section VII – Accounting Information

Information required under Statement No. 67 of the Governmental Accounting Standard Board (GASB) is shown below:

A. Summary of Significant Accounting Policies

Method used to value investments.

Investments are reported at fair value.

B. Plan Description

Plan administration

The City of Woburn, Massachusetts, administers the Contributory Retirement System (Plan), a defined benefit pension plan that covers all employees of participating units except teachers, elected officials and those employees in service at the time of its establishment who elected not to become members. Eligible employees in the City who enter service on or after the date the System became operative for their classification may become members of the Retirement System on their own application.

Plan membership

Plan membership is summarized in Schedule C.

Benefits provided

Please see Schedule B of the report for a summary of plan provisions.

Contributions

The City establishes contributions based on an actuarially determined contribution recommended by an independent actuary. The actuarially determined contribution is developed using the Entry Age Normal Actuarial Cost Method. For the sponsor fiscal year ended June 30, 2020, the City contributed $8,820,047 to the plan.

C. Investments

Rate of return

For the year ended December 31, 2019, the annual money-weighted rate of return on pension plan investments, net of pension plan investment expense, was 19.36%[1]. The money-weighted rate of return expresses investment performance, net of investment expense, adjusted for the changing amounts actually invested.

D. Receivables

No receivable contributions have been included in plan assets.

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[1] The GASB standard requires a dollar-weighted rate of return calculation with cash flows determined at least monthly. The information provided does not have sufficient detail to perform this calculation, therefore, we used a common standard estimation technique to provide a reasonable representation of the rate of return. A more refined calculation of the rate of return can be determined if the actual dates of contribution and a monthly breakdown of benefit payments and expenses is provided.

Section VII – Accounting Information (continued)

E. Net Pension Liability

The components of the net pension liability at December 31, 2019, were as follows:

Components of Net Pension Liability	
Total pension liability	$ 249,632,270
Plan fiduciary net position	(159,393,849)
City's net pension liability	$ 90,238,421
Plan fiduciary net position as a percentage of the total pension liability	63.85%

F. Actuarial assumptions

The total pension liability was determined by an actuarial valuation as of December 31, 2019, using the following actuarial assumptions, applied to all periods included in the measurement. The assumptions used to develop the figures presented for GASB 67 and 68 are the same as those set forth in Schedule A of the report except where noted:

Actuarial Assumptions	
Inflation	3.00%
Salary Increases	4.00% per annum
Investment rate of return	7.50%, net of pension plan investment expenses. This is based on an average inflation rate of 3.00% and a real rate of return of 4.50%.

It is assumed that healthy mortality is represented by the RP-2014 Total Employee and Healthy Annuitant Mortality Tables, rolled back to 2006 and projected with Mortality Improvement Scale MP-2019. Mortality for disabled members is represented by the RP-2014 Disabled Mortality Table, rolled back to 2006 and projected with Mortality Improvement Scale MP-2019.

The long-term expected rate of return on Fund investments was determined using best-estimate ranges of expected future nominal rates of return (expected returns, net of investment expense and inflation) developed for each major asset class using an econometric model that forecasts a variety of economic environments and then calculates asset class returns based on functional relationships between the economic variables and the asset classes. Best estimates of arithmetic rates of return for each major asset class included in the pension plan's target asset allocation as of December 31, 2019 are summarized in the following table:

Asset Class	Long-Term Expected Real Rate of Return
Equity	6.51%
Fixed income	0.71%
Alternatives	7.73%

Nominal long-term expected rates of return for these asset classes are equal to the sum of the above expected long-term real rates and the expected long-term inflation rate of 2.55%.

Section VII – Accounting Information (continued)

Discount rate

The discount rate used to measure the total pension liability was 7.50%. The projection of cash flows used to determine the discount rate assumed that City contributions will continue to follow the current funding policy. Based on those assumptions, the pension plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Had there been a point where assets were projected to be depleted, a municipal bond rate of 3.26% would have been used in the development of the blended GASB discount rate after that point. The 3.26% rate is based on the S&P Municipal Bond 20 Year High Grade Rate Index.

Sensitivity of the net pension liability to changes in the discount rate

The following presents the net pension liability, calculated using the discount rate of 7.50%, as well as what the net pension liability would be if it were calculated using a discount rate that is 1-percentage-point lower (6.50%) or 1-percentage-point higher (8.50%) than the current rate:

	1% Decrease (6.50%)	Current Discount Rate (7.50%)	1% Increase (8.50%)
Net Pension Liability	$ 117,310,845	$ 90,238,421	$ 67,251,717

Section VII – Accounting Information (continued)

Schedules of Required Supplementary Information

Schedule of Changes in Net Pension Liability and Related Ratios

	2019
Total pension liability	
Service cost	$ 4,221,083
Interest	17,219,059
Differences between expected and actual experience	11,094,128
Changes of assumptions	(1,496,268)
Benefit payments	(14,775,506)
Net change in total pension liability	$ 16,262,496
Total pension liability-beginning	$ 233,369,774
Total pension liability-ending (a)	$ 249,632,270
Plan fiduciary net pension	
Contributions-employer	$ 8,820,047
Contributions-employee	3,326,313
Net investment income	26,092,957
Benefit payments, including refunds of employee contributions	(14,775,506)
Administrative expense	(631,631)
Other	374,312
Net change in plan fiduciary net position	$ 23,206,492
Plan fiduciary net position-beginning	$ 136,187,357
Plan fiduciary net position-ending (b)	$ 159,393,849
Net pension liability	
Net pension liability-ending (a)-(b)	$ 90,238,421
Covered payroll[1]	$ 29,406,301
Net pension liability as a percentage of payroll	306.87%

Notes to Schedule:

Changes of assumptions

The mortality assumption was changed to the RP-2014 Total Employee and Healthy Annuitant Mortality Tables, rolled back to 2006 and projected with Mortality Improvement Scale MP-2019. Mortality for disabled members is represented by the RP-2014 Disabled Mortality Table, rolled back to 2006 and projected with Mortality Improvement Scale MP-2019.

[1] The covered payroll shown here is based off census data provided for the January 1, 2020 actuarial valuation. According to GASB Statement Nos. 67 and 68, as amended by GASB Statement No. 82, this should be payroll on which contributions are based for the measurement period. Therefore, this number may need to be updated for inclusion in financial statements.

Section VII – Accounting Information (continued)

Schedules of Required Supplementary Information (continued)

Schedule of Contributions

	2020	2019
Actuarially determined contribution	$ 8,820,047	$ 8,502,325
Contributions related to the actuarially determined contribution	(8,820,047)	(8,502,325)
Contribution deficiency (excess)	$ 0	$ 0

Notes to Schedule:

A. Valuation date

Actuarially determined contribution rates are calculated as of January 1 in the fiscal year preceding the fiscal year in which contributions are made. That is, the contribution calculated as of January 1, 2020 will be made during the fiscal year ended June 30, 2021.

B. Methods and assumptions used to determine contribution rates:

Please see Schedule A of the report.

Schedule of Investment Returns

	2019	2018
Annual money-weighted rate of return, net of investment expenses[1]	19.36%	(6.30%)

[1] The GASB standard requires a dollar-weighted rate of return calculation with cash flows determined at least monthly. The information provided does not have sufficient detail to perform this calculation, therefore, we used a common standard estimation technique to provide a reasonable representation of the rate of return. A more refined calculation of the rate of return can be determined if the actual dates of contribution and a monthly breakdown of benefit payments and expenses is provided.

Schedule A - Actuarial Assumptions and Methods

Actuarial Cost Method

Individual entry-age normal cost method.

Asset Valuation Method for Funding Purposes

For funding calculation purposes, assets are valued according to the following general formula, provided such value is within a 20% corridor of the market value:

VA	=	$MV - .8I_1 - .6I_2 - .4I_3 - .2I_4$	where
VA	=	Valuation assets.	
MV	=	Market value of assets as of the valuation date.	
I_n	=	Investment gain (loss) during n^{th} year preceding the valuation date.	

Valuation Interest Rate

7.50% per annum, compounded annually, net of investment expenses. The long-term expected rate of return on Fund investments was determined using best-estimate ranges of expected future nominal rates of return (expected returns, net of investment expense and inflation) developed for each major asset class using an econometric model that forecasts a variety of economic environments and then calculates asset class returns based on functional relationships between the economic variables and the asset classes.

Interest rate for accounting

7.50% per year, compounded annually. Projected benefit payments that are expected to be paid from available plan assets are discounted at the valuation interest rate of 7.50%. After the point where plan assets are not available to pay benefits, projected benefit payments are discounted at the municipal bond rate. The valuation rate for accounting purposes is the effective rate resulting from this process.

Municipal bond rate

3.26%. This rate is based on the S&P Municipal Bond 20 Year High Grade Rate Index as of December 31, 2019 the Measurement date for GASB 67 purposes.

Mortality

It is assumed that healthy mortality is represented by the RP-2014 Total Employee and Healthy Annuitant Mortality Tables, rolled back to 2006 and projected with Mortality Improvement Scale MP-2019. Mortality for disabled members is represented by the RP-2014 Disabled Mortality Table, rolled back to 2006 and projected with Mortality Improvement Scale MP-2019.

It is assumed that 80% of all active deaths are ordinary (20% are service connected).

Schedule A - Actuarial Assumptions and Methods (continued)

Separations from Active Service

Representative values of the assumed annual rates of withdrawal and vesting, disability and service retirement, all based on an analysis of experience, are as follows:

General Employees-Annual Rates of

		Service Retirement	
Age	Disability	Male	Female
25	.02%		
30	.03		
35	.06		
40	.10		
45	.15		
50	.19	1.0%	1.5%
55	.24	2.0	5.5
60	.28	12.0	5.0
62	.30	30.0	15.0
65	.30	40.0	15.0
69		30.0	20.0

Years of Service	Rates of Withdrawal
0	15.0%
1	12.0%
2	10.0%
3	9.0%
4	8.0%
5	7.6%
10	5.4%
15	3.3%
20	2.0%
25	1.0%
30+	0.0%

Police and Fire-Annual Rates of

Age	Disability	Service Retirements
25	0.20%	
30	0.30	
35	0.30	
40	0.30	
45	1.00	1.0%
50	1.25	2.0
55	1.20	15.0
60	0.85	20.0
62	0.75	25.0
65	0.00	100.0
69		

Years of Service	Rates of Withdrawal
0	1.5%
1	1.5
2	1.5
3	1.5
4	1.5
5	1.5
6	1.5
7	1.5
8	1.5
9	1.5
10	1.5
11+	0.0

It is assumed for the general employees that 40% of all disabilities are ordinary (60% are service connected). For police and fire employees, 10% of all disabilities are assumed to be ordinary (90% are service connected). A load was applied to the accidental disability liability to account for the additional benefit payable for each dependent child upon the member's disability. Loads of approximately 2% and 11.7% were developed for Group 1 and Group 4, respectively, taking into account the higher likelihood of Group 4 accidental disabilities at younger ages, thus the likelihood of Group 4 having more dependent children than Group 1 accidental disability retirees.

These assumptions are commonly used throughout the Massachusetts Public Pension Systems and were selected for this plan since its employees are of similar demographic composition to those in other systems.

Schedule A - Actuarial Assumptions and Methods (continued)

Salary Scale

4.00% per annum.

Cost-of-Living Adjustments

Retirement benefits were assumed to increase annually at the assumed inflation rate of 3.00%, up to the applicable annual maximum. The inflation assumption was developed in the same analysis that supported the valuation interest rate.

Form of Payment

Future retirees are assumed to elect a Life Annuity. Future vested terminations are assumed to elect a refund of contributions unless specifically reported by the plan sponsor to be eligible for an annuity benefit.

Marital Percentage

80% of participants are assumed to be married at death. Husbands are assumed to be 3 years older than their wives.

Loading or Contingency Reserve

None.

Administrative Expenses

The normal cost is increased by an amount equal to the anticipated administrative expenses for the upcoming fiscal year. The amount for plan year 2020 is $600,000 and is anticipated to increase at 3.0% per year.

GASB 67 and 68 Measurement Date

December 31, 2019.

Schedule B - Summary of System Provisions

Membership

The Retirement System covers all employees of participating units except teachers, elected officials and those employees in service at the time of its establishment who elected not to become members. Eligible employees in the City who enter service on or after the date the System became operative for their classification may become members of the Retirement System on their own application.

Summary of Benefit and Contribution Provisions

A summary of the main benefit and contribution provisions of the Retirement System, as interpreted for the valuation, is presented below.

The terms “Group 1” and “Group 4” are used to denote “general employees” and “police and fire”, respectively.

Benefits

Final Average Salary (FAS)

For those hired prior to April 2, 2012, the average of a member’s three highest consecutive years’ compensation. For those hired on or after April 2, 2012, the average of a member’s five highest consecutive years’ compensation. For those hired on or after January 1, 2011, salary taken into account for benefit purposes is capped at 64% of the IRC Section 401(a)(17) limit (indexed).

Superannuation Retirement

Eligibility

For those hired prior to April 2, 2012: Age 65 for Group 1; Age 55 for Group 4. Maximum retirement age is 70 for Group 1 and 65 for Group 4.

For those hired on or after April 2, 2012: Age 67 for Group1; Age 57 for Group 4 if member has completed 30 years of service, or age 62 otherwise.

Allowance

2.5% per year of service times FAS. Maximum total allowance is 80% of FAS. Veterans receive additional $15 annually per year of service to a maximum of $300 annually.

Early Retirement

Eligibility

20 years of service, or age 55 with 10 years of service. Group 1 members hired after April 1, 2012 are eligible upon the attainment of age 60 and 10 years of service.

Allowance

Calculated as a superannuation retirement allowance (including veteran’s benefits) except accrual rate is equal to 2.5% reduced by .1% for each year age at retirement is below either 65 for Group 1 or 55 for Group 4. If hired after April 1, 2012, the accrual rate of 2.5% is reduced by .15% for each year age at retirement precedes age 67 for Group 1 or age 57 for Group 4 (age 62 if service at retirement is less than 30 years).

The minimum allowance after 30 years of service is equal to:

(1) An annuity which is the actuarial equivalent of member’s accumulated deductions; and

(2) A pension equal to 1/3 of FAS and any veteran’s benefits as described under superannuation retirement.

Schedule B - Summary of System Provisions (continued)

Vested Retirement

Eligibility

10 years of service. For certain involuntary terminations, this is reduced to 6 years.

Allowance

A superannuation retirement allowance commencing at age 55 for Group 1 members (age 60 if hired after April 1, 2012) and age 45 for Group 4 members (age 55 if hired after April 1, 2012) or later, where the accrual rate is determined by the age of the member at the time the allowance commences.

In lieu of the deferred pension benefit, a member may elect to receive a refund of their accumulated contributions. Members with ten or more years of service are entitled to 100% of the credited interest on their contributions. Members with five to ten years of service are entitled to 50% of the credited interest on their contributions. No credited interest is provided for members with less than five years of service.

Ordinary Disability

Eligibility

10 years of service

Allowance

An immediate allowance equal to the age 55 rate for Group 1 members or age 45 rate for Group 4 members per year of service times FAS.

Veterans receive an allowance equal to:

(1) An annuity which is the actuarial equivalent of their accumulated deductions; and

(2) A pension which is the greater of 50% of current salary and the service retirement allowance to which they are eligible, if any.

Accidental Disability

Eligibility

Permanent incapacity for further duty as a result of personal injury sustained while in the performance of duties.

Allowance

An immediate allowance equal to:

(1) An annuity which is the actuarial equivalent of the member's accumulated deductions; and

(2) A pension equal to 72% of current salary; and

(3) A supplement equal to $797.64 per year per child under 21.

The maximum total allowance is 100% of current salary.

Accidental Death Benefit

Eligibility

Death due to an occupational injury.

Allowance

An immediate allowance equal to:

(1) A lump sum payment equal to the accumulated deductions at death; and

(2) A pension equal to 72% of current salary and payable to the surviving spouse, dependent children, or the dependent parents; and

(3) A supplement of $312 per year per child payable to the spouse or legal guardian until all children reach age 21, unless handicapped.

The maximum total allowance is 100% of current salary.

Schedule B - Summary of System Provisions (continued)

Death in Active Service

Eligibility

Death of a member due to a non-occupational injury.

Allowance

An immediate allowance that would have been payable had the member retired and elected the 2/3 joint and survivor option on the day before his death. For death occurring prior to the minimum superannuation retirement age, the age 55 (age 60 if hired after April 1, 2012) and age 45 (age 55 if hired after April 1, 2012) accrual rates are used, respectively, for Group 1 and Group 4 members.

For members with at least 2 years of service at death, the surviving spouse receives an additional allowance equal to the sum of $1,440 per year for the first child and $1,080 per year for each additional child.

The maximum total allowance is 100% of salary at the date of death.

Normal Form of Benefit

Reduced modified cash refund annuity.

Optional Forms of Benefit

(1) Life annuity.

(2) Modified cash refund annuity.

(3) 66-2/3% joint and survivor allowance.

Return of Contribution

If no other benefit is payable upon termination, the member's accumulated deductions are returned.

Post-Retirement Adjustments

In accordance with the adoption of Chapter 17 of the Acts of 1997, the granting of a cost-of-living adjustment will be determined by an annual vote by the Retirement Board. The amount of increase will be based upon the Consumer Price Index, limited to a maximum of 3.0%, beginning on July 1. All retirees, disabled retirees, and beneficiaries who have been receiving benefits payments for at least one year as of July 1 are eligible for the adjustment. All COLAs granted to members after 1981 and prior to July 1, 1998 are deemed to be an obligation of the State and are not the liability of the Retirement System. The maximum annual amount of pension benefit subject to a COLA is given by the following schedule:

Year	Annual Maximum
Prior to 2019	$12,000
2019	$13,000
2020	$14,000
2021	$15,000
2022	$16,000
2023	$17,000
2024 and later	$18,000

Schedule B - Summary of System Provisions (continued)

Member Contributions

Members contribute a percentage of annual regular compensation in accordance with their respective dates of hire, as shown below:

Date of Hire	Rate of Contribution
Prior to January 1, 1975	5%
On or after January 1, 1975	7%
On or after January 1, 1984	8%
On or after July 1, 1996	9%

Members hired on or after January 1, 1979 contribute an additional 2% of compensation in excess of $30,000.

The contribution rate for Group 1 participants hired on or after April 2, 2014 and who attain 30 years of service is reduced by three percentage points.

Schedule C - Membership Tables

Table 1 – Age/Service Distribution with Salary as of January 1, 2020

Attained Age	Average Salary < 5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
20-24	7									7
	44,035									44,035
25-29	20	4	1							25
	39,349	60,697	36,200							42,638
30-34	23	17	2							42
	51,762	69,705	61,453							59,486
35-39	8	18	15	2						43
	53,353	73,845	78,318	85,143						72,119
40-44	12	6	7	9	2					36
	46,240	51,046	67,498	93,811	64,822					64,099
45-49	11	4	13	15	5	4	1			53
	29,506	45,462	71,151	88,309	85,683	78,395	60,859			67,149
50-54	11	11	17	13	9	15	5			81
	38,795	46,208	51,084	89,311	75,984	85,438	105,786			67,393
55-59	10	19	12	25	9	8	17	3		103
	29,924	44,082	49,695	51,796	50,093	93,624	90,596	132,153		59,849
60-64	7	3	8	17	10	4	8	2	1	60
	32,868	55,723	37,258	48,526	58,268	80,275	82,724	113,204	167,089	57,989
65-69	1	4	2	8	3	1	2		1	22
	22,255	49,029	48,040	57,835	69,916	40,174	49,824		123,976	56,849
70+	1	1	1	2		1				6
	11,882	17,560	4,500	54,631		69,618				35,470
Total Employees	111	87	78	91	38	33	33	5	2	478
Average Salary	41,281	57,147	58,907	68,044	65,399	84,092	87,617	124,574	145,532	61,519

Schedule C - Membership Tables (continued)

Table 2 - The Number and Annual Pensions of Retired Members Distributed by Age as of January 1, 2020

	Service Retirements		Disability Retirements		Beneficiaries	
Age	Number	Annual Pension	Number	Annual Pension	Number	Annual Pension
Under 20	0	0	0	0	0	0
20 - 24	0	0	0	0	1	32,021
25 - 29	0	0	0	0	0	0
30 - 34	0	0	0	0	0	0
35 - 39	0	0	0	0	1	70,085
40 – 44	0	0	1	43,029	0	0
45 - 49	0	0	1	22,612	1	1,437
50 - 54	2	36,166	3	90,928	2	54,326
55 - 59	25	843,842	10	444,855	3	68,149
60 - 64	63	1,984,378	4	173,413	8	178,014
65 - 69	66	2,559,111	4	217,658	16	605,955
70 - 74	83	2,935,814	9	372,767	11	247,216
75 - 79	38	1,203,968	1	28,014	7	149,123
80 - 84	42	1,122,802	1	61,793	15	282,803
85 - 89	26	570,355	1	47,719	17	311,031
90 - 94	18	333,288	0	0	8	105,417
95 - 99	3	62,461	0	0	2	23,103
100 and over	0	0	0	0	2	14,441
Total	366	11,652,185	35	1,502,788	94	2,143,121

Schedule D - Projection of Expected Pension Payments

Year	Amount	Year	Amount
2020	$16,965,116	2045	$24,252,707
2021	16,946,406	2046	23,967,086
2022	17,673,216	2047	23,618,437
2023	18,376,223	2048	23,240,822
2024	19,141,548	2049	22,834,623
2025	19,825,461	2050	22,326,110
2026	20,487,533	2051	21,705,785
2027	21,104,131	2052	20,999,299
2028	21,723,556	2053	20,295,513
2029	22,348,536	2054	19,551,265
2030	22,928,164	2055	18,790,731
2031	23,455,426	2056	18,029,600
2032	23,909,755	2057	17,268,798
2033	24,308,757	2058	16,494,979
2034	24,617,898	2059	15,721,964
2035	24,823,297	2060	14,953,836
2036	24,947,658	2061	14,193,168
2037	25,033,249	2062	13,440,062
2038	25,146,479	2063	12,702,108
2039	25,247,340	2064	11,980,963
2040	25,184,342	2065	11,292,034
2041	25,086,410	2066	10,624,321
2042	24,926,568	2067	9,975,561
2043	24,768,292	2068	9,347,483
2044	24,526,496	2069	8,742,859

Schedule E - GASB 68 Information

1. The determination of the average expected remaining service lives of all members, as follows:

Remaining Service Lives Group	Number	Service	Average
Retired paid from fund	495	0	
Terminated with deferred benefit	104	0	
Active	478	4,877	
Total	1,077	4,877	4.53

2. The determination of pension expense for the fiscal year as shown below:

Pension Expense	Fiscal Year Ending June 30, 2020
Service Cost	$ 4,221,083
Interest Cost on Total Pension Liability	17,219,059
Differences between Expected and Actual Experience	3,201,589
Changes of Assumptions	1,583,110
Contributions-Member	(3,326,313)
Projected Earnings on Plan Investments	(10,096,789)
Differences between Projected and Actual Earnings	597,064
Plan Changes	0
Administrative Expenses	631,631
Other	(374,312)
Total Pension Expense	$ 13,656,122

3. The schedule of changes in Net Pension Liability:

Change in Net Pension Liability	Fiscal Year Ending June 30, 2020
Net pension liability at June 30, 2019	$ 97,182,417
Changes for the year:	
Service Cost	4,221,083
Interest Cost of Total Pension Liability	17,219,059
Projected Earnings on Plan Investments	(10,096,789)
Contributions-Employer	(8,820,047)
Contributions-Member	(3,326,313)
Administrative Expenses	631,631
Plan Changes	0
Deferred Inflows/(Outflows)	
Changes in Assumptions	(1,496,268)
Differences between Expected and Actual Liability Experience	11,094,128
Difference between Projected and Actual Earnings	(15,996,168)
Other	(374,312)
Net Change in Net Pension Liability	(6,943,996)
Net pension liability at June 30, 2020	$ 90,238,421

Schedule F – Schedule of Deferred Inflows and Outflows

Schedule of Differences Between Projected and Actual Earnings

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	Outflows	Inflows	Total
Amount Established	$ 2,291,299	$ 11,691,609	$ (1,641,920)	$ (11,343,662)	$ 20,275,467	$ (15,996,168)			
Recognition Period	5.00	5.00	5.00	5.00	5.00	5.00			
Amount Recognized in FY:									
2015	$ 458,260	$ -	$ -	$ -	$ -	$ -	$ 458,260	$ -	$ 458,260
2016	458,260	2,338,322	-	-	-	-	2,796,582	-	2,796,582
2017	458,260	2,338,322	(328,384)	-	-	-	2,796,582	(328,384)	2,468,198
2018	458,260	2,338,322	(328,384)	(2,268,732)	-	-	2,796,582	(2,597,116)	199,466
2019	458,259	2,338,322	(328,384)	(2,268,732)	4,055,093	-	6,851,674	(2,597,116)	4,254,558
2020	-	2,338,321	(328,384)	(2,268,732)	4,055,093	(3,199,234)	6,393,414	(5,796,350)	597,064
2021	-	-	(328,384)	(2,268,732)	4,055,093	(3,199,234)	4,055,093	(5,796,350)	(1,741,257)
2022	-	-	-	(2,268,734)	4,055,093	(3,199,234)	4,055,093	(5,467,968)	(1,412,875)
2023	-	-	-	-	4,055,095	(3,199,234)	4,055,095	(3,199,234)	855,861
2024	-	-	-	-	-	(3,199,232)	-	(3,199,232)	(3,199,232)
2025	-	-	-	-	-	-	-	-	-
2026	-	-	-	-	-	-	-	-	-
2027	-	-	-	-	-	-	-	-	-

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	Outflows	Inflows	Total
Deferred Balance at 6/30:									
2015	$ 1,833,039	$ -	$ -	$ -	$ -	$ -	$ 1,833,039	$ -	$ 1,833,039
2016	1,374,779	9,353,287	-	-	-	-	10,728,066	-	10,728,066
2017	916,519	7,014,965	(1,313,536)	-	-	-	7,931,484	(1,313,536)	6,617,948
2018	458,259	4,676,643	(985,152)	(9,074,930)	-	-	5,134,902	(10,060,082)	(4,925,180)
2019	-	2,338,321	(656,768)	(6,806,198)	16,220,374	-	18,558,695	(7,462,966)	11,095,729
2020	-	-	(328,384)	(4,537,466)	12,165,281	(12,796,934)	12,165,281	(17,662,784)	(5,497,503)
2021	-	-	-	(2,268,734)	8,110,188	(9,597,700)	8,110,188	(11,866,434)	(3,756,246)
2022	-	-	-	-	4,055,095	(6,398,466)	4,055,095	(6,398,466)	(2,343,371)
2023	-	-	-	-	-	(3,199,232)	-	(3,199,232)	(3,199,232)
2024	-	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-	-
2026	-	-	-	-	-	-	-	-	-

Schedule F – Schedule of Deferred Inflows and Outflows (continued)

Schedule of Differences Between Expected and Actual Experience

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	Outflows	Inflows	Total
Amount Established	$ -	$ 3,531,873	$ -	$ 250,301	$ -	$ 11,094,128			
Recognition Period	5.63	5.00	5.00	5.42	5.42	4.53			
Amount Recognized in FY:									
2015	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2016	-	706,375	-	-	-	-	706,375	-	706,375
2017	-	706,375	-	-	-	-	706,375	-	706,375
2018	-	706,375	-	46,181	-	-	752,556	-	752,556
2019	-	706,375	-	46,181	-	-	752,556	-	752,556
2020	-	706,373	-	46,181	-	2,449,035	3,201,589	-	3,201,589
2021	-	-	-	46,181	-	2,449,035	2,495,216	-	2,495,216
2022	-	-	-	46,181	-	2,449,035	2,495,216	-	2,495,216
2023	-	-	-	19,396	-	2,449,035	2,468,431	-	2,468,431
2024	-	-	-	-	-	1,297,988	1,297,988	-	1,297,988
2025	-	-	-	-	-	-	-	-	-
2026	-	-	-	-	-	-	-	-	-
2027	-	-	-	-	-	-	-	-	-

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	Outflows	Inflows	Total
Deferred Balance at 6/30:									
2015	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2016	-	2,825,498	-	-	-	-	2,825,498	-	2,825,498
2017	-	2,119,123	-	-	-	-	2,119,123	-	2,119,123
2018	-	1,412,748	-	204,120	-	-	1,616,868	-	1,616,868
2019	-	706,373	-	157,939	-	-	864,312	-	864,312
2020	-	-	-	111,758	-	8,645,093	8,756,851	-	8,756,851
2021	-	-	-	65,577	-	6,196,058	6,261,635	-	6,261,635
2022	-	-	-	19,396	-	3,747,023	3,766,419	-	3,766,419
2023	-	-	-	-	-	1,297,988	1,297,988	-	1,297,988
2024	-	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-	-
2026	-	-	-	-	-	-	-	-	-

Schedule F – Schedule of Deferred Inflows and Outflows (continued)

Schedule of Changes in Assumptions

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	Outflows	Inflows	Total
Amount Established	$6,330,561	$ 3,810,330	$ -	$ 2,400,814	$ -	$ (1,496,268)			
Recognition Period	5.63	5.00	5.00	5.42	5.42	4.53			
Amount Recognized in FY:									
2015	$1,124,434	$ -	$ -	$ -	$ -	$ -	$1,124,434	$ -	$1,124,434
2016	1,124,434	762,066	-	-	-	-	1,886,500	-	1,886,500
2017	1,124,434	762,066	-	-	-	-	1,886,500	-	1,886,500
2018	1,124,434	762,066	-	442,955	-	-	2,329,455	-	2,329,455
2019	1,124,434	762,066	-	442,955	-	-	2,329,455	-	2,329,455
2020	708,391	762,066	-	442,955	-	(330,302)	1,913,412	(330,302)	1,583,110
2021	-	-	-	442,955	-	(330,302)	442,955	(330,302)	112,653
2022	-	-	-	442,955	-	(330,302)	442,955	(330,302)	112,653
2023	-	-	-	186,039	-	(330,302)	186,039	(330,302)	(144,263)
2024	-	-	-	-	-	(175,060)	-	(175,060)	(175,060)
2025	-	-	-	-	-	-	-	-	-
2026	-	-	-	-	-	-	-	-	-
2027	-	-	-	-	-	-	-	-	-

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	Outflows	Inflows	Total
Deferred Balance at 6/30:									
2015	$5,206,127	$ -	$ -	$ -	$ -	$ -	$5,206,127	$ -	$5,206,127
2016	4,081,693	3,048,264	-	-	-	-	7,129,957	-	7,129,957
2017	2,957,259	2,286,198	-	-	-	-	5,243,457	-	5,243,457
2018	1,832,825	1,524,132	-	1,957,859	-	-	5,314,816	-	5,314,816
2019	708,391	762,066	-	1,514,904	-	-	2,985,361	-	2,985,361
2020	-	-	-	1,071,949	-	(1,165,966)	1,071,949	(1,165,966)	(94,017)
2021	-	-	-	628,994	-	(835,664)	628,994	(835,664)	(206,670)
2022	-	-	-	186,039	-	(505,362)	186,039	(505,362)	(319,323)
2023	-	-	-	-	-	(175,060)	-	(175,060)	(175,060)
2024	-	-	-	-	-	-	-	-	-
2025	-	-	-	-	-	-	-	-	-
2026	-	-	-	-	-	-	-	-	-

Schedule G - Net Pension Liability Allocations as of June 30, 2019 and June 30, 2020 by Employer

	Fiscal Year Ended June 30, 2019		Fiscal Year Ended June 30, 2020				
Employer Name	Employer Proportion	Net Pension Liability	Employer Proportion	Changes in Proportion	Net Pension Liability	Net Pension Liability: 1% Decrease	Net Pension Liability: 1% Increase
City of Woburn	96.1100%	93,402,021	96.4300%	8,505,171	87,016,909	113,122,848	64,850,831
Woburn Housing Authority	3.8900%	3,780,396	3.5700%	314,876	3,221,512	4,187,997	2,400,886
Woburn Redevelopment Authority	0.0000%	0	0.0000%	0	0	0	0
Total	**100.0000%**	**$ 97,182,417**	**100.0000%**	**$ 8,820,047**	**$ 90,238,421**	**$ 117,310,845**	**$ 67,251,717**

Schedule H - Allocations of Pension Amounts as of June 30, 2020 by Employer

			Deferred Outflows of Resources				
Employer Name	Employer Proportion	Net Pension Liability	Difference Between Expected and Actual Experience	Changes in Assumptions	Changes in Benefits	Difference Between Projected and Actual Investment Earnings	Changes in Proportion
City of Woburn	96.4300%	87,016,909	8,444,231	1,033,680	0	11,730,980	269,585
Woburn Housing Authority	3.5700%	3,221,512	312,620	38,269	0	434,301	(273,304)
Woburn Redevelopment Authority	0.0000%	0	0	0	0	0	0
Total	**100.0000%**	**$ 90,238,421**	**$ 8,756,851**	**$ 1,071,949**	**$ 0**	**$ 12,165,281**	**$ (3,719)**

	Deferred Inflows of Resources					
Employer Name	Difference Between Expected and Actual Experience	Changes in Assumptions	Changes in Benefits	Difference Between Projected and Actual Investment Earnings	Changes in Proportion	Difference Between Employer Contributions and Proportionate Share of Total Contributions
City of Woburn	0	(1,124,341)	0	(17,032,223)	273,304	0
Woburn Housing Authority	0	(41,625)	0	(630,561)	(269,585)	0
Woburn Redevelopment Authority	0	0	0	0	0	0
Total	**$ 0**	**$ (1,165,966)**	**$ 0**	**$(17,662,784)**	**$ 3,719**	**$ 0**

Schedule H - Allocations of Pension Amounts as of June 30, 2020 by Employer (continued)

	Pension Expense Recognized		
Employer Name	Proportionate Share of Pension Plan Expense	Changes in Proportion	Total
City of Woburn	13,168,598	23,729	13,192,327
Woburn Housing Authority	487,524	(23,729)	463,795
Woburn Redevelopment Authority	0	0	0
Total	**$ 13,656,122**	**$ 0**	**$ 13,656,122**

Schedule I - Employers’ Proportionate Share of the June 30, 2020 Deferred Outflows/Inflows

Employer Name	Fiscal Year Ending June 30, 2020	June 30, 2021	June 30, 2022	June 30, 2023	June 30, 2024	Thereafter	Total
City of Woburn	$ 5,213,363	$ 862,717	$ 1,114,856	$ 3,060,079	$ (1,989,040)	$ -	$ 8,261,975
Woburn Housing Authority	168,400	3,895	80,138	119,950	(87,264)	-	285,119
Woburn Redevelopment Authority	-	-	-	-	-	-	-
Total	**$ 5,381,763**	**$ 866,612**	**$ 1,194,994**	**$ 3,180,029**	**$ (2,076,304)**	**$ -**	**$ 8,547,094**

Schedule J – ASOP 51 Disclosures

Funding future retirement benefits prior to when those benefits become due involves assumptions regarding future economic and demographic experience. These assumptions are applied to calculate actuarial liabilities and the corresponding funded status of the Plan. However, to the extent future experience deviates from the assumptions used, variations will occur in these calculated values. These variations create risk to the Plan. Understanding the risks to the funding of the Plan is important. Therefore, a new Actuarial Standard of Practice (ASOP) has been adopted. Actuarial Standard of Practice No. 51 ("ASOP 51") requires certain disclosures of potential risks to the Plan and provides useful information for intended users of actuarial reports that determine Plan contributions or evaluate the adequacy of specified contribution levels to support benefit provisions.

Under ASOP 51, risk is defined as the potential of actual future measurements deviating from expected future measurements resulting from actual future experience deviating from actuarially assumed experience. It is important to note that not all risk is negative, but all risk should be understood and accepted based on knowledge, judgment and educated decisions. Future measurements may deviate in ways that produce positive or negative financial effects on the Plan.

In the actuary's professional judgment, the following risks may reasonably be anticipated to significantly affect the Plan's future financial condition.

- Investment risk – the risk that assets will not return as expected
- Longevity and other demographic risk – the risk that mortality or other demographic experience will be different from expected
- Contribution risk —the risk that actual future contributions deviate from expected future contributions, e.g., that actual contributions are not made in accordance with the plan's funding policy

The following information is provided to comply with ASOP 51 and furnish beneficial information on potential risks to the Plan. This list is not all-inclusive; it is an attempt to identify the most significant risks and how those risks might affect the results shown in this report.

Note that ASOP 51 does not require the actuary to evaluate the ability or willingness of the plan sponsor to make contributions to the plan when due, or to assess the likelihood or consequences of potential future changes in law. In addition, this valuation report is not intended to provide investment advice or to provide guidance on the management or reduction of risk. Buck welcomes the opportunity to assist in such matters as part of a separate project or projects utilizing the appropriate staff and resources for those objectives.

Investment Risk

Plan costs are very sensitive to the market return. Lower than assumed asset returns will increase costs:

- The lower market return will cause the market value of assets to be lower than expected.
- The plan uses an actuarial value of assets that smooths gains and losses on market returns over a five-year period to help control some of the volatility in costs due to investment risk.

Longevity and Other Demographic Risk

Plan costs will be increased as participants are expected to live longer. This is because:

- Benefits are paid over a longer lifetime when life expectancy is expected to increase. The longer duration of payments leads to higher liabilities.
- Health care has been improving which increases the life expectancy of participants. As health care improves, costs to the plan will increase.
- The mortality assumption for the Plan does assume future improvement in mortality. Any improvement in future mortality greater than that expected by the current mortality assumption would lead to increased costs for the Plan.

Schedule J – ASOP 51 Disclosures (continued)

Contribution Risk

There is a risk associated with the employer's contribution when the actual amount and actuarially determined amount differ.

- When the actual contribution is lower than the actuarially determined contribution, the Plan may not be sustainable in the long term.
- Any underpayment of the contribution will increase future contribution amounts to help pay off the additional Unfunded Actuarial Accrued Liability associated with the underpayment.
- This risk is mitigated by the City's compliance with Section 22D of MGL Chapter 32, which outlines various requirements of a funding schedule that will amortize the unfunded actuarial liability and cover normal costs.

Historical Information

The following shows selected historical values of key valuation measures. These items illustrate how actual volatility has impacted the Plan in recent years and gives additional context to the risks described above. Further information can be found in the actuarial valuation reports for each year.

Valuation Date	01/01/10	01/01/12	01/01/14	01/01/16	01/01/18	Current Valuation 01/01/20
Liabilities and Assets at Valuation Date						
• Actuarial Accrued Liability (AAL)	154,299,627	162,639,000	179,447,442	205,524,287	226,383,224	252,067,065
- Normal Cost	1,251,905	1,102,851	1,278,863	1,689,532	1,772,183	1,863,524
• Actuarial Value of Assets (AVA)	104,707,479	106,181,870	115,874,621	129,316,338	143,513,760	153,889,068
- Funded Percent (AVA)	68%	65%	65%	63%	63%	61%
• Market Value of Assets (MVA)	91,646,242	99,150,970	125,275,573	123,972,843	148,441,286	159,393,849
- Funded Percent (MVA)	59%	61%	70%	60%	66%	63%
Contributions and Disbursements for Plan Year Ended	2009	2011	2013	2015	2017	2019
• Actuarially Determined Contribution (ADC)	4,479,763	4,913,904	5,338,819	6,000,000	7,616,072	8,820,047
• Actual Contribution	4,479,763	4,913,904	5,338,819	6,000,000	7,616,072	8,820,047
• Disbursements	8,927,632	10,895,318	11,606,884	12,699,684	14,108,756	15,407,137
Rates of Return for Plan Year Ended		2011	2013	2015	2017	2019
• Assumed		8.25%	8.00%	7.75%	7.50%	7.50%
• AVA		2.32%	12.95%	7.25%	9.02%	6.52%
• MVA		0.10%	18.70%	-1.19%	16.53%	19.36%
Maturity Measures at Valuation Date						
• Payroll	27,433,458	27,681,194	28,945,300	29,187,382	30,893,029	29,406,301
- Asset Volatility Ratio (MVA / Payroll)	3.3	3.6	4.3	4.2	4.8	5.4
- Liability Volatilty Ratio (AAL / Payroll)	5.6	5.9	6.2	7.0	7.3	8.6
• Retiree and Beneficiary (In-pay) Liability	70,856,107	79,724,425	87,643,180	110,635,442	125,783,901	153,498,460
- Percent of Total Liability	46%	49%	49%	54%	56%	61%
• Contributions minus Disbursements in Prior Year	(4,447,869)	(5,981,414)	(6,268,065)	(6,699,684)	(6,492,684)	(6,587,090)
- Percent Average Market Value of Assets	N/A	-6.3%	-5.6%	-5.4%	-4.8%	-4.3%

Schedule J – ASOP 51 Disclosures (continued)

Plan Maturity Measures

There are certain measures that may aid in understanding the significant risks to the plan.

Contribution Volatility

Asset Volatility Ratio: Plans that have higher asset-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return. For example, a plan with an asset-to-payroll ratio of 10 may experience twice the contribution volatility due to investment return volatility than a plan with an asset-to-payroll ratio of 5.

Liability Volatility Ratio: Plans that have higher liability-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to changes in liability. For example, if an assumption change increases the liability of two plans by the same percent the plan with a liability-to-payroll ratio of 10 may experience twice the contribution volatility than a plan with a liability-to-payroll ratio of 5.

Ratio of Retiree and Beneficiary Liability to Total Liability

A mature plan will often have a ratio above 60 - 65 percent. An increasing percentage may indicate a need for a less risky asset allocation which may lead to a lower long-term return on assets assumption and increased costs.

Ratio of Cash Flow to Assets (Contributions minus Disbursements)

When this cash flow ratio is negative more cash is being paid out than deposited in the fund. Negative cash flow means the fund needs to rely on investment returns to cover benefit payments and at the same time may need to invest in more liquid assets to cover the benefit payments. More liquid assets may not garner the same returns as less liquid assets and therefore increase the investment risk.